

**Problem 1** – During part of its orbit around Earth, the Van Allen Probes travel along the line given by the equation  $y = -1/2 x + 2$ . Graph this line on the grid above.

**Problem 2** – Earth's magnetic field is oriented along lines that are parallel to  $y = 3/4 X$ . Draw three of these lines across the grid above.

**Problem 3** – What is the equation of the line that is perpendicular to the spacecraft trajectory? Plot this line on the graph above.

**Problem 4** – What angle does the magnetic field make with respect to the direction along the spacecraft trajectory?

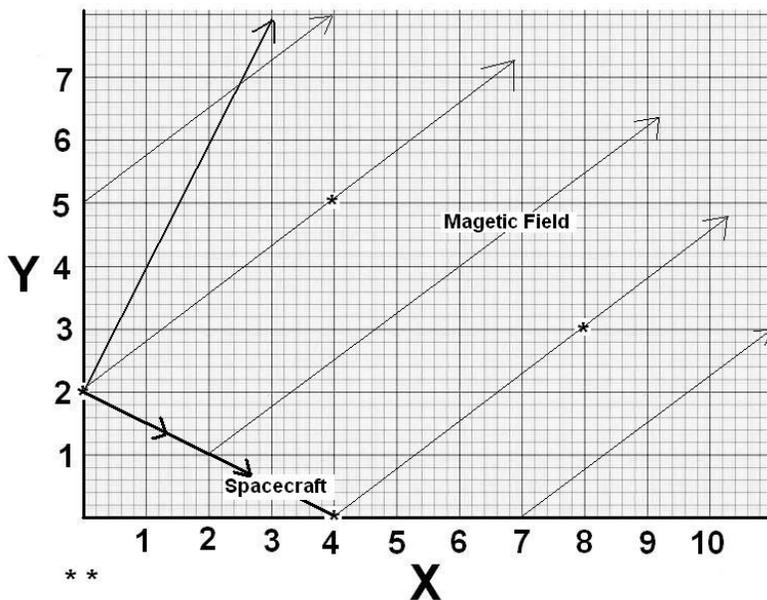
**Problem 5** - What angle does the magnetic field make with respect to the direction perpendicular to the spacecraft trajectory?

**Problem 1** – During part of its orbit around Earth, the Van Allen Probes travel along the line given by the equation  $y = -1/2 x + 2$ . Graph this line on the grid above. Answer: See below, labeled 'spacecraft'

**Problem 2** – Earth's magnetic field is oriented along lines that are parallel to  $y = 3/4 X$ . Draw three of these lines across the grid above. Answer: See below: Labeled 'magnetic field'

**Problem 3** – What is the equation of the line that is perpendicular to the spacecraft trajectory? Plot this line on the graph above.

Answer: The perpendicular line to  $y = mx+b$  is  $y = -1/m x + b$ . The slopes are the negative reciprocals of each other. If the spacecraft direction is  $y = -1/2 X + 2$ , then the perpendicular is  $y = 2x+2$  at point  $(0,+2)$ , as shown in the figure.



**Problem 4** – What angle does the magnetic field make with respect to the direction along the spacecraft trajectory?

Answer: Use a protractor to measure the angle. It is **63 degrees**.

**Problem 5** - What angle does the magnetic field make with respect to the direction perpendicular to the spacecraft trajectory?

Answer: It will be the compliment angle,  $90-63 = 27$  **degrees**.